

Performance Contracting in State of Michigan Facilities

A Case Study Of the

MI Career & Technical Institute and MI School for the Deaf and Blind

The cost of energy dramatically increased in the mid 1990's for the State of Michigan, Departments of Education and Career Development. To help alleviate the pressure of high-energy costs and improve facility system equipment and operation, the State of Michigan decided to implement an energy performance contract in June 1994 for the following two state-owned facilities:

- **Michigan Career and Technical Institute (MCTI), Department of Career Development**
- **Michigan School for the Deaf and Blind (MSDB), Department of Education**

Through a competitive process, the State of Michigan selected Chevron Energy Services, Inc., Riverside, MO, as the energy services contractor with the best contract proposal based on response to the request for proposal (RFP). This 9- year performance contract will end in October 2005.

The MCTI/MSDB project was completed in four phases:

1. *Preliminary analysis* to verify or confirm the feasibility for an energy performance contract i.e., total project investment, total project investment and average simple payback
2. *Detailed engineering analysis* to determine estimated energy fuel/cost savings and project implementation costs
3. *Implementation* of selected energy efficient opportunities (ECOs)
4. *Monitoring* energy savings from the implemented measures

The Michigan Energy Office performed the preliminary analysis, which was part of the RFP. The detailed engineering analysis, performed by Chevron Energy Services, served as the foundation for the performance contract project.

The Detailed Engineering Analysis

The detailed engineering analysis was conducted in a five-step process.

The first step, an onsite survey, involved the collection of information concerning the structures, lighting, heating, ventilating and air conditioning equipment, miscellaneous energy using equipment and facility operations that impact energy usage. It was necessary to make direct observations, collect recorded data and take measurements to obtain this information.

The second step involved the development of a list of ECOs to evaluate. This list of ECOs encompassed the initial list of energy efficiency opportunities plus opportunities

suggested by operating staffs and other measures which came to light during a detailed organization of all survey data.

The third step was to select an approach for evaluating each ECO. This approach involved detailed engineering analysis and computer modeling. Computer modeling was used when it was necessary to account for interacting effects and when numerous similar types of calculations were needed to evaluate the item.

Step four was to implement the approach on each ECO. This evaluation included determining potential savings for each measure, estimating implementation costs and performing payback calculations.

The fifth and final step was the development of a written report that covered the detailed engineering analysis for each building and the entire site. The report presented the recommended ECOs for each facility plus a facility utility analysis.

The Recommended ECOs

MCTI ECOs							
No.	Measure Description	Total Cost	Annual Electric Savings	Annual Fossil Savings	Total Annual Savings	Simple Payback Years	
1	Incandescent To Fluorescent	\$0	\$0	\$0	\$0	0.00	
2	Incandescent to PL Fluorescent	\$47,709	\$9,330	-\$475	\$8,855	5.39	
3	Incandescent to Circular Fluorescent	\$2,171	\$1,112	-\$57	\$1,056	2.06	
4	Delamp	\$2,929	\$868	-\$44	\$824	3.55	
5	T8 Lamps/Electronic Ballasts	\$8,688	\$1,237	-\$63	\$1,174	7.40	
6	Specular Reflectors; T8 Lamps; Electronic Ballasts	\$25,760	\$5,972	-\$304	\$5,668	4.54	
7	Fluorescent Exit Light Retrofits	\$2,099	\$463	-\$24	\$439	4.78	
8	EMS and Programmable Thermostats	\$122,134	\$8,772	\$29,427	\$38,199	3.20	
9	Pool Cover	\$10,450	\$536	\$3,399	\$3,934	2.66	
10	New Roof Insulation	\$813,966	\$151	\$2,766	\$2,917	279.05	
11	Double Pane Windows	\$175,251	\$0	\$1,655	\$1,655	105.86	
12	Stack Gas Economizer	\$76,120	\$0	\$1,152	\$1,152	66.09	
13	Automatic O2 Trim	\$0	\$0	\$0	\$0	0..00	
14	Boiler Turbulators	\$12,923	\$0	\$2,429	\$2,429	5.32	
15	Blowdown Heat Recovery	\$0	\$0	\$0	\$0	0.00	
16	Multizone to Variable Air Volume	\$26,174	\$979	-\$209	\$769	34.02	
17	Energy Efficient Motors	\$10,685	\$424	\$0	\$242	25.23	
18	Roof Vent Dampers	\$0	\$0	\$0	\$0	0.00	
19	Power Factor Correction	\$0	\$0	\$0	\$0	0.00	
20	Attic Insulation	\$0	\$0	\$0	\$0	0.00	
	TOTAL	\$1,337,059.00	\$29,844.00	\$39,652.00	\$69,313.00	19.29	
MCTI Selected ECOs		Included 2,3,4,5,6,7,8,9,14	\$234,863	\$28,289	\$34,289	\$62,578	3.75

MSDB ECOs							
No.	Measure Description	Total Cost	Annual Electric Savings	Annual Fossil Savings	Total Annual Savings	Simple Payback Years	
1	Incandescent to Fluorescent	\$1,117	\$391	-\$8	\$383	2.92	
2	Incandescent to PL Fluorescent	\$6,867	\$1,549	-\$33	\$1,516	4.53	
3	Incandescent to Circular Fluorescent	\$847	\$292	-\$6	\$286	2.97	
4	Delamp	\$0	\$0	\$0	\$0	0.00	
5	T8 Lamps and Electronic Ballasts	\$13,969	\$2,060	-\$44	\$2,016	6.93	
6	Specular Reflectors; T8 Lamps; Electronic Ballasts	\$6,040	\$800	-\$17	\$783	7.71	
7	Fluorescent Exit Light Retrofits	\$2,087	\$837	-\$18	\$819	2.55	
8	EMS and Programmable Thermostats	\$117,072	\$1,663	\$28,209	\$29,871	3.92	
9	Pool Cover	\$7,920	\$323	\$2,480	\$2,803	2.83	
10	New Roof Insulation	\$122,997	\$0	\$343	\$343	359.10	
11	Double Pane Windows	\$76,142	\$0	\$742	\$742	102.6	
12	Stack Gas Economizer	\$78,375	\$0	\$1,909	\$1,909	41.05	
13	Automatic O2 Trim	\$47,850	\$0	\$1,820	\$1,820	4.42	
14	Boiler Turbulators	\$3,154	\$0	\$139	\$139	22.74	
15	Blowdown Heat Recovery	\$7,469	-\$112	\$1,800	\$1,689	4.42	
16	Multizone to Variable Air Volume	\$0	\$0	\$0	\$0	0.00	
17	Energy Efficient Motors	\$0	\$0	\$0	\$0	0.00	
18	Roof Vent Dampers	\$4,107	\$16	\$285	\$301	13.64	
19	Power Factor Correction	\$11,648	\$1,060	\$0	\$1,060	10.99	
20	Attic Insulation	\$3,649	\$25	\$257	\$282	12.94	
	TOTAL	\$511,310.00	\$8,904.00	\$37,858.00	\$46,762.00	10.93	
MSDB Selected ECOs		Includes # 1,2,3,5,6,7,8,9,15,18,20	\$171,144	\$7,843	\$32,906	\$40,749	4.20

Operation and Maintenance

In addition to implementing ECOs, a good operation and maintenance (O&M) program is vital in minimizing energy consumption and attendant costs too. A few of the O&M items presented in the MCTI/MSDB detailed engineering analysis report included:

Administration	
<ul style="list-style-type: none"> Review importance of conserving energy with staff annually; indicate what they can do to reduce the waste of energy dollars. 	<ul style="list-style-type: none"> Where possible, schedule more maintenance and custodial work during daylight hours and to overlap with normal occupied hours.
Building Envelope	
<ul style="list-style-type: none"> Check door weather stripping and repair or replace as needed. 	<ul style="list-style-type: none"> Replace cracked and broken windows as soon as they are found.
Primary Heating System	
<ul style="list-style-type: none"> Inspect boilers each year, repair as needed. 	<ul style="list-style-type: none"> Check steam traps annually and replace or repair with a kit on an as-needed basis.

Primary Cooling System	
<ul style="list-style-type: none"> Clean cooling tower annually, check water distribution over tower, fill and adjust as needed. 	<ul style="list-style-type: none"> Check condenser coil and clean before each cooling season. Clean during cooling season on an as-needed basis.
Heating, Ventilation and Air Conditioning (HVAC)	
<ul style="list-style-type: none"> Inspect filters on all HVAC equipment quarterly, clean or replace as needed. 	<ul style="list-style-type: none"> Check calibration of thermostats annually and repair as needed.
Domestic Hot Water (DHW) System	
<ul style="list-style-type: none"> Install timers to turn off DHW pumps during unoccupied times. 	<ul style="list-style-type: none"> Turn off DHW heater when hot water is not required for an extended time.
Lighting Systems	
<ul style="list-style-type: none"> Whenever burned out lamps are replaced, clean the light fixtures and lens at the time of replacement. 	<ul style="list-style-type: none"> Use group relamping in building when practical.
Electrical System	
<ul style="list-style-type: none"> When electric motors fail, replace them with energy efficient units. 	<ul style="list-style-type: none"> Turn off refrigerators and deep freezers when they are not needed for an extended period of time.
Portable Water	
<ul style="list-style-type: none"> Repair faucets and water taps as soon as dripping from shut-off faucets and water taps is noted. 	
Special Systems	
<ul style="list-style-type: none"> Clean condenser coils on refrigeration equipment annually. 	

Monitoring Results

The first six years of the project produced cumulative excess savings for the State of Michigan of \$125,962. Percentages of annual energy usage reduction are represented in the following table.

Performance Contract Monitoring Results				
	MCTI		MSDB	
Year	% KWh Reduction	% mcf Reduction	% KWh Reduction	% mcf Reduction
1	11%	15%	4%	17%
2	8%	34%	8%	38%
3	3%	32%	5%	37%
4	-	37%	8%	36%
5	-	30%	5%	16%
6	3%	38%	3%	4%

For more information about this and other performance contracting projects in State of Michigan facilities, contact the MI Dept of Labor & Economic Growth, Energy Office, P.O. Box 30221, Lansing, MI 48909; TEL 517/ 241-6228.